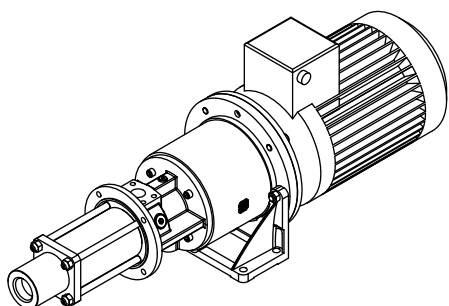
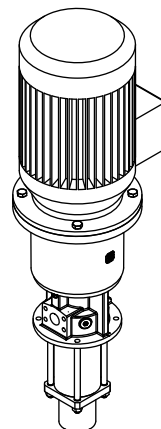




KRAL Screw Pumps.

W Series

OIW 01en
Edition 2019-11
Original instructions

Table of contents

About this document			
□ General information	3	□ Removing the pump	18
□ Target groups	3	▪ Removing the pump	18
□ Symbols	3	Operation	
□ Danger levels	4	□ Commissioning	20
□ Associated documents	4	▪ Safety instructions for commissioning	20
□ General safety instructions	4	▪ Protect the pump against soiling	20
		▪ Cleaning the piping system	20
		▪ Filling and venting the pump	20
		▪ Checking the direction of rotation	21
		▪ Initial commissioning the pump	22
Labeling		□ During operation	23
□ Type code	5	▪ Checking the operating pressure	23
□ Rating plate	5	□ Switching off the pump	23
		□ Resuming pump operation	23
Technical data		Repairs	
□ Proper use	6	□ Maintenance	24
□ Improper use	6	▪ Required maintenance	24
□ Operational limits	6	▪ Maintaining the ball bearing	24
□ Required NPSH values	7	□ Replacing the coupling	24
□ Noise levels	8	▪ General drawing	24
□ Weights	8	▪ Removing the torsionally elastic coupling	25
▪ Weight of pump with free shaft end	8	▪ Installing the torsionally elastic coupling	26
▪ Weight of the completion	8	□ Replacing the mechanical seal and ball bearing	27
		▪ Removal of mechanical seal and ball bearing	28
		▪ Installation of mechanical seal and ball bearing	28
Function description		□ Replacing the screw set	29
□ General drawing of a screw pump	10	▪ Removing the screw set	29
□ General drawing of screw pump with coupling and motor	10	▪ Installing the screw set	30
□ Function description	11	□ Replacing the Domsel type radial shaft seal	31
□ Shaft seal	11	▪ Removing the radial shaft seal	32
▪ Mechanical seal	11	▪ Installing the radial shaft seal	32
▪ Seal variants	11	Troubleshooting	
□ Back pressure valve	12	□ Information about faults	33
		▪ Possible faults	33
		▪ Troubleshooting	33
Transportation, storage and disposal		Spare parts	
□ Unpacking and checking the state of delivery	13	□ Maintenance kits	36
□ Raising the pump/motor-driven pump	13	▪ W 15 – 118	36
□ Storage	13	□ Accessories	37
□ Preservation	14	▪ Tool kits for LFI/LVI/LFT/LVT/LFM/WS	37
▪ Preserving the internal surfaces of the pump	14	□ Completions	37
▪ Preserving the external surfaces of the pump	14		
▪ Removing the preservative	14	Appendix	
□ Safety instruction for disposal	14	□ Tightening torques	38
□ Disposing of the pump	14	□ Contents of the EC Declaration of Conformity	38
		□ Notes	39
Installation, removal and connection			
□ Installation	15		
▪ Installing the pump	15		
▪ Protect the pump against soiling	16		
▪ Connecting the pump to the piping system	16		
▪ Aligning and checking the shaft coupling	17		
□ Electrical connection	18		
▪ Connecting the pump	18		

General information

General information

The operating instructions form part of the pump or motor-driven pump. The operating instructions must be kept for future reference. Furthermore please observe the operating instructions for the drive motor.

Target groups

Target group	Tasks
Operator-owner	☐ Keep these instructions available at the installation site for future reference. ☐ Ensure that employees read and observe these instructions and the associated documents, in particular the safety instructions and warnings. ☐ Observe additional plant-specific directives and regulations.
Specialist personnel, fitters	☐ Read, observe and follow these instructions and the associated documents, in particular the safety instructions and warnings.

Symbols

Symbol	Meaning
	Warning personal injury
	Notice
	Procedures mechanical installation
	Procedures electrical installation
	Check or fault table
	Request for action

Danger levels

Danger levels

	Warning	Danger level	Consequences of non-observances
	DANGER	Immediate threat of danger	Serious personal injury, death
	WARNING	Possible threat of danger	Serious personal injury, invalidity
	CAUTION	Potentially dangerous situation	Slight personal injury
	CAUTION	Potentially dangerous situation	Material damage

Associated documents

ATEX supplementary instructions for operation in potentially explosive areas
Declaration of conformity according to EU Directive 2006/42/EC
Declaration of conformity according to EU Directive 2014/34/EU
Manufacturer's declaration according to EU Directive 2014/68/EU
Technical documentation for supplied components

General safety instructions

The following general safety instructions must be observed:

- ☐ No liability is accepted for damage arising through non-observance of the operating instructions.
 - Read the operating instructions carefully and observe them.
 - The operator-owner is responsible for the observance of the operating instructions.
 - Installation, removal and installation work may only be carried out by specialist personnel.
- ☐ Do not use KRAL pumps outside the performance limitations specified on the rating plate and in the "Technical data" section. In the case of operating data that does not agree with the specifications on the rating plate, please contact the manufacturer.
- ☐ In order for the warranty to remain valid, corrective maintenance carried out during the warranty period requires the express permission of the manufacturer.
- ☐ Observe the general regulations for the prevention of accidents as well as the local safety and operating instructions.
- ☐ Observe the valid national and international standards and specifications of the installation location.
- ☐ In case of systems with an increased potential of danger to humans and/or machines the failure of a pump may not lead to injuries or damage to property.
 - Always equip systems with an increased potential of danger with alarm equipment.
 - Maintain and check the protective/alarm equipment regularly.
- ☐ The pumped liquids can be dangerous (for example hot, dangerous to health, poisonous, combustible). Observe the safety regulations for handling dangerous materials.
- ☐ Pumped liquids can be subject to high pressure and can cause damage and/or personal injury should leaks occur.

Type code

Type code

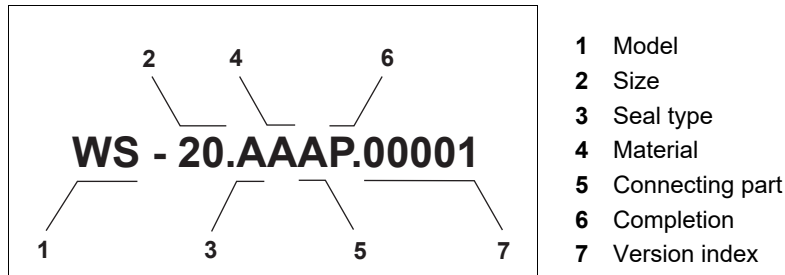


Fig. 1 Type code

Item	Designation	Type
1	Model	WS: Pump with free shaft end / motor-driven pump with pressure-side SAE flange
2	Size	Corresponds to flow rate in [l/min] at 1450 min ⁻¹
3	Seal type	A: Standard mechanical seal B: Mechanical seal of hard material C: Standard radial shaft seal D: Magnetic coupling F: Radial shaft seal, high-temperature model X: Special heating system
4	Material	A: GJS Tenifer screw casing, standard screws B: Plastic-coated screw casing, standard screws
5	Connecting part suction side	A: Pipe thread connection axial X: Special Design
6	Completion	P: Pump with free shaft end F: Motor-driven pump with pump bracket pedestal V: Motor-driven pump without pump bracket pedestal M: Motor-driven pump on motor base
7	Version index	For internal administration

Rating plate

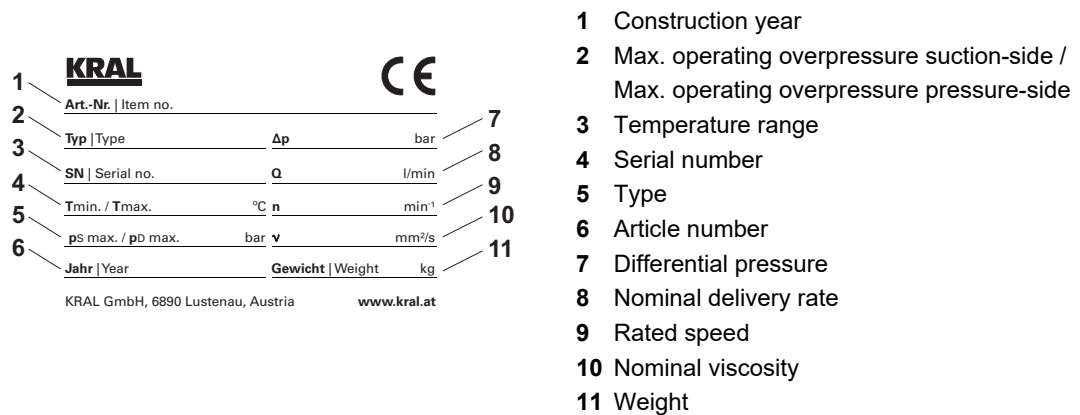


Fig. 2 Rating plate

Proper use

Proper use

KRAL screw pumps of the W series are used to deliver lubricating liquids or cutting emulsions and cutting oils. Both the concentration and the size of solid particles carried in the emulsion affect the service life of the pump. The maximum size of the particles should not exceed 70 µm. It is always to your advantage to use filters with a higher separation factor. The W pumps are not suitable for delivering emulsions containing hard particles, e.g. hardened steel, corundum, hard metal or silicon carbide. The pumps may only be used within the operational limits described within this chapter.

Improper use

The pump is not suitable for delivering gases or media with a high concentration of solids. Operating data that deviates from the values on the rating plate and the operational limits can cause damage to the pump. If there is any doubt whether deviating operating data can cause damage, inform the manufacturer.

Operational limits

	Sizes					
	W 15 – W 20	W 32 – W 42	W 55 – W 85	W 105 – W 118	W 160 – W 210	W 235 – W 275
Operating pressure max. [bar]	120					
Temperature max. [°C] GJS screw casing						
☐ Standard mechanical seal	150					
☐ Mechanical seal of hard material	180					
☐ Standard radial shaft seal	80					
☐ Radial shaft seal high-temperature model	150					
☐ Magnetic coupling	250					
Temperature max. [°C] Plastic-coated screw casing	60					
Temperature min. [°C] for pump materials	-10					
Viscosity [mm²/s] min.–max.	1 10000					
Rotating speed max. [1/min]						
– at 50 Hz	2900					
– at 60 Hz	3600					
Inlet pressure max. [bar]						
☐ Mechanical seal	6					
☐ Radial shaft seal	2					
☐ Magnetic coupling	6					

Tab. 1 Operational limits

Required NPSH values

Required NPSH values

The following table shows the required NPSH values to ensure that the various pump sizes can be operated without cavitation. These values are derived from the pump kinematics during operation with a low-volatility pumped liquid such as lubricating oil or hydraulic liquid.

The following examples indicate that when pumped liquids have a readily volatile component content the required NPSH values notably increase:

- ☐ Fuel oil requires an NPSH value of at least 6 mWC.
- ☐ When the pumped liquid contains water (e.g. heavy fuel oil), the values in the table have to be increased by the vapor pressure of the water at the specified operating temperature.

The required NPSH values also needs to be increased if there are gas contents, regardless of whether it is dissolved or not. In case of any doubt, contact the manufacturer.

Size	Viscosity	Rotating speed [1/min]				Size	Viscosity	Rotating speed [1/min]			
	[mm ² /s]	1450	1750	2900	3500		[mm ² /s]	1450	1750	2900	3500
	NPSH value [mWC]						NPSH value [mWC]				
W 15	6	2				W 105	6	2		2.7	3.2
	37	2					37	2	2.2	3	3.6
	152	2			2.2		152	2.4	2.6	3.6	4.4
	380	2		2.7	3		380	2.8	3.1	4.4	5.4
W 20	6	2				W 118	6	2		3.1	3.9
	37	2					37	2.2		3.5	4.4
	152	2		2.4	2.7		152	2.5	2.8	4.3	5.4
	380	2.2	2.4	3.2	3.8		380	3	3.3	5.3	6.8
W 32	6	2				W 160	6	2		2.9	3.6
	37	2					37	2		3.3	4
	152	2		2.3	2.6		152	2.5	2.7	3.9	5
	380	2.2	2.4	3.1	3.7		380	2.9	3.2	4.9	6.2
W 42	6	2			2.3	W 210	6	2.1		4	5.2
	37	2		2.1	2.6		37	2.4	2.7	4.5	6
	152	2		2.8	3.5		152	2.8	3.2	5.5	—
	380	2.5	2.7	4	4.8		380	3.5	4	6.9	—
W 55	6	2				W 235	6	2		3.5	4.5
	37	2			2.7		37	2.3	2.5	4	5.1
	152	2.1		2.8	3.3		152	2.7	3	4.9	—
	380	2.5	2.7	3.5	4.0		380	3.2	3.6	—	
W 74	6	2		2.6	3.0	W 275	6	2.3		4.5	6.1
	37	2		2.9	3.4		37	2.5	2.9	5.1	7
	152	2.3	2.5	3.3	4.1		152	3	3.5	6.3	—
	380	2.7	3.0	4.4	5.0		380	3.6	4.2	—	
W85	6	2		2.8	3.4						
	37	2		3.1	3.8						
	152	2.4	2.6	3.8	4.6						
	380	2.8	3.1	4.6	5.8						

Tab. 2 Required NPSH values

Noise levels

Noise levels

	Max. noise level ± 3 dB(A) [dB(A)]					
	W 15-20	W 32-42	W 55-85	W 105-118	W 160-210	W 235-275
Pump (at 2900 r.p.m.)	56	59	63	65	69	71
Motor max.						
– at 40 bar	62	68	74	74	72	78
– at 80 bar	68	74	72	72	73	74
Pump + motor						
– at 40 bar	63	69	75	75	74	79
– at 80 bar	63	68	73	73	75	75

Tab. 3 Noise levels

Weights

Weight of pump with free shaft end

	Size												
	W	W	W	W	W	W	W	W	W	W	W	W	W
	15	20	32	42	55	74	85	105	118	160	210	235	275
Weight [kg]	13	13	19	19	36	36	36	44	44				

Tab. 4 Weight table of W-pump with free shaft end

Weight of the completion

Motor size	Motor weight [kg]	Size												
		W	W	W	W	W	W	W	W	W	W	W	W	
		15	20	32	42	55	74	85	105	118	160	210	235	275
		Weight of pump bracket with coupling and screws [kg]												
80	10	3.5									—			
90S	12	3.5									—			
90L	14	3.5									—			
100L	21	4.5		3										
112M	28	3												
132S	39	4												
132M	45	4												
160M	110	—		5.5								3		
160L	120	—		5.5								3		
180M	165	—				8								
180L	170	—				8								
200L	230	—						10						
225M	280	—						13						
250M	365	—										22		

Tab. 5 Weight table of completion without pedestal

Motor size	Motor weight [kg]	Pump size												
		W	W	W	W	W	W	W	W	W	W	W	W	W
		15	20	32	42	55	74	85	105	118	160	210	235	275
		Weight of pump bracket with pedestal, coupling and screws [kg]												
80	10	4									—			
90S	12	4									—			
90L	14	4									—			
100L	21	5		4										
112M	28	4												
132S	39	5												
132M	45	5												
160M	110	—		7.5								10		
160L	120	—		7.5								10		
180M	165	—				12								
180L	170	—				12								
200L	230	—							16					
225M	280	—							14					
250M	365	—											50	

Tab. 6 Weight table of completion with pedestal

General drawing of a screw pump

General drawing of a screw pump

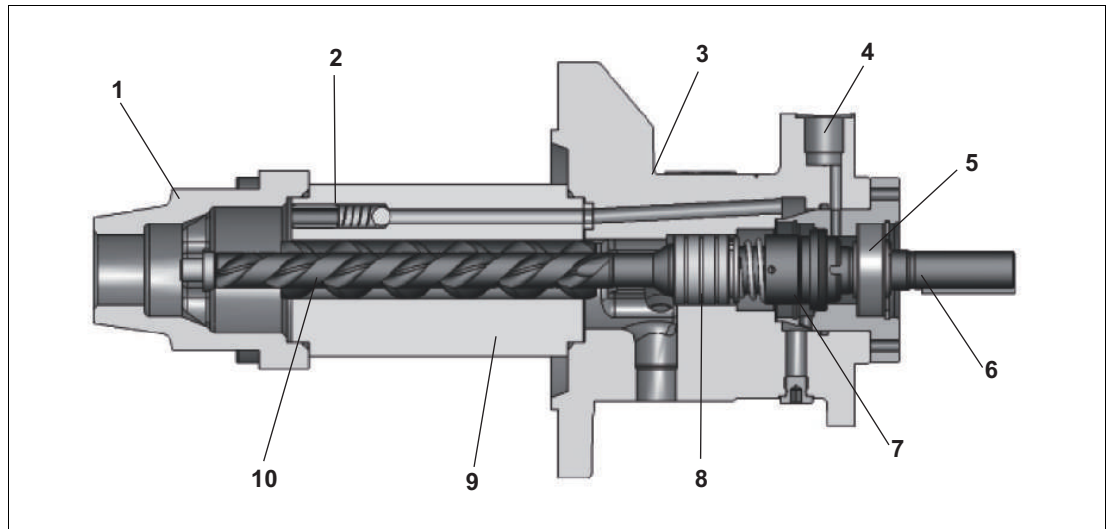


Fig. 1 Structure of a screw pump

- | | |
|-----------------------|----------------------|
| 1 Suction cover | 6 Main screw |
| 2 Back pressure valve | 7 Mechanical seal |
| 3 Pressure casing | 8 Balancing cylinder |
| 4 Leakage connection | 9 Pump casing |
| 5 Ball bearing | 10 Idle screw |

General drawing of screw pump with coupling and motor

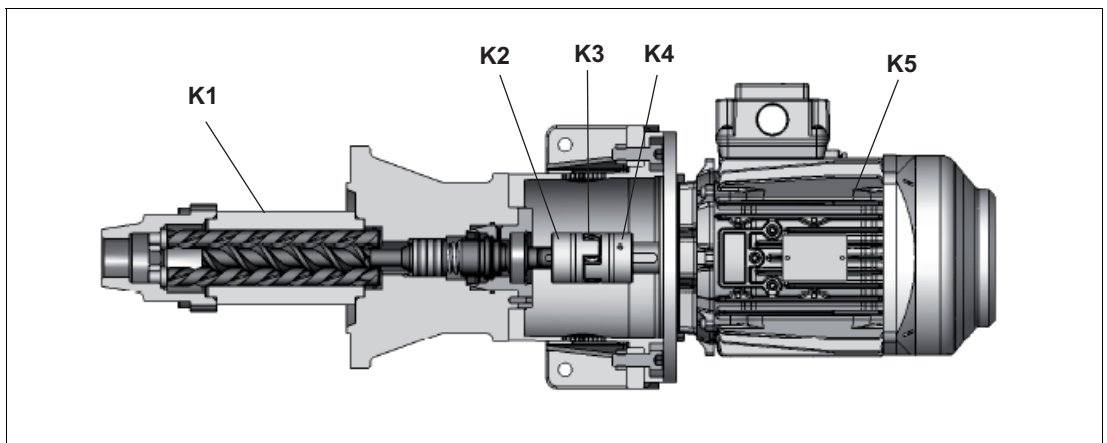


Fig. 2 Design of screw pump with coupling and motor

- | | |
|-------------------------------|----------------------------|
| K1 Pump | K2 Motor-end coupling half |
| K2 Pump-end coupling half | K5 Motor |
| K3 Coupling intermediate ring | |

Function description

Function description

Screw pumps belong to the rotating displacement group of pumps. In these pumps a special form allows an almost tight engagement of three intermeshing screws **6,10** to be achieved. Together with the pump casing **9** that encompasses the screw package, closed volumes are achieved by this means.

The standard direction of rotation of the pump is clockwise as seen from the drive (indicated by an arrow on the pressure casing **3**). When the main screw **6** is driven by a motor, the idle screws **10** follow the main screw due to the meshing. The displacement effect of the pump results from the rotation of the screws that leads to a continuous filling, axial displacement and discharge of the volumes described above.

Shaft seal

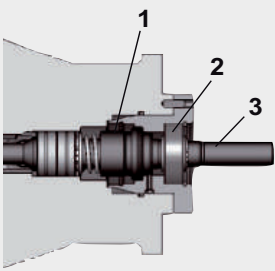
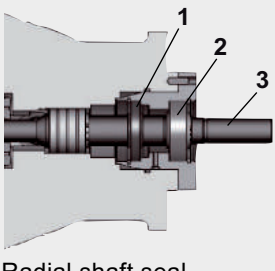
The pump is sealed at the main screw outlet by a shaft seal. Depending on the pump type, the following types of seal are used:

- ☐ Mechanical seal
- ☐ Radial shaft seal
- ☐ Magnetic coupling

Mechanical seal

Mechanical seals require constant lubrication. The inevitable minimal leakage caused by the lubrication of the mechanical seal only amounts to a few cubic centimeters per hour and is imperative for proper functioning of the seal. Generally this leakage will evaporate and not even be noticeable. However, with low-volatility liquids such as heavy oil, the leakage will be visible. The leakage vent hole in the pressure casing allows draining of this regular leakage **4**. At use of a mechanical seal the permeability of the leakage vent holes has to be ensured. Dry running must be avoided at all costs, as the seal will overheat and be destroyed in a matter of minutes.

Seal variants

Figure	Legend	Description
 Mechanical seal	1 Mechanical seal 2 Ball bearing 3 Main screw	Mechanical seals are used as durable shaft seals in the standard design for liquids up to 150 °C. In the version made of mechanically resistant material, high-quality elastomers allow sealing for temperatures of up to 180 °C as well as slightly abrasive liquids. Higher inlet pressures of 6 bars are permissible.
 Radial shaft seal	1 Radial shaft seal 2 Ball bearing 3 Main screw	Radial shaft seals can be used for temperatures up to 90 °C or 150 °C, depending on the material. Each seal rings used has a lip for sealing against the loss of liquid and the entry of air.

Tab. 1 Seal variants

Back pressure valve

Back pressure valve

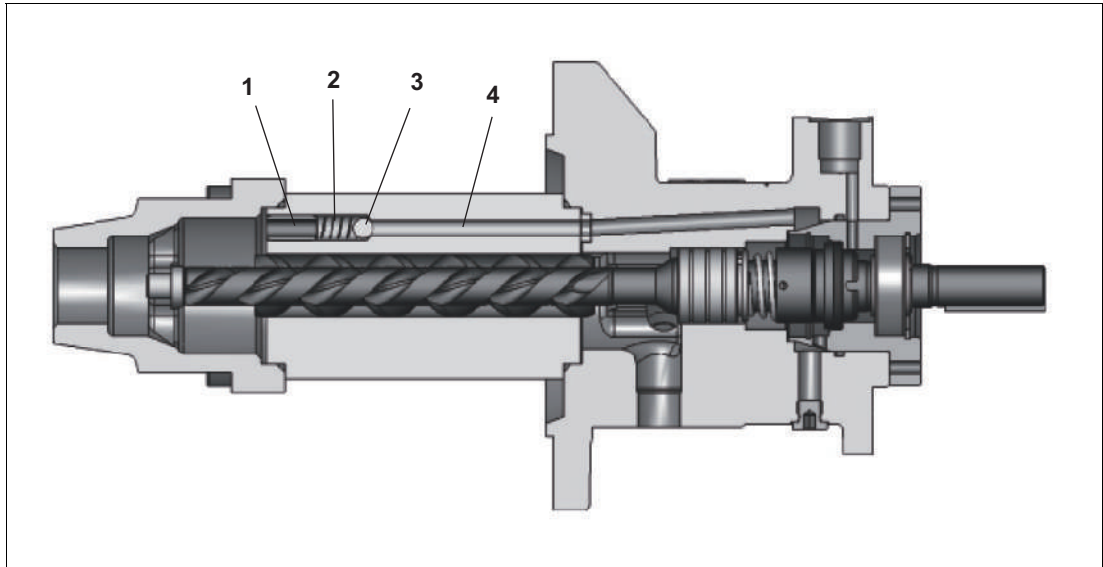


Fig. 3 Back pressure valve installation position

- | | |
|-------------------------|------------------|
| 1 Adapter sleeve | 3 Ball |
| 2 Spring | 4 Leakage |

To ensure the proper functioning of mechanical seals, they must be constantly lubricated by the pumped liquid. This also requires greater pressure on the liquid-filled inside of the seal than in the atmosphere. To ensure this even when the pump is installed above the liquid level, a spring-loaded back pressure valve is mounted in the relief line of the seal chamber.

Unpacking and checking the state of delivery

Unpacking and checking the state of delivery

1. On delivery unpack the pump/motor-driven pump and check for damage during transportation.
2. Report damage during transportation immediately to the manufacturer.
3. Dispose of packing material in accordance with the locally applicable regulations.

Raising the pump/motor-driven pump

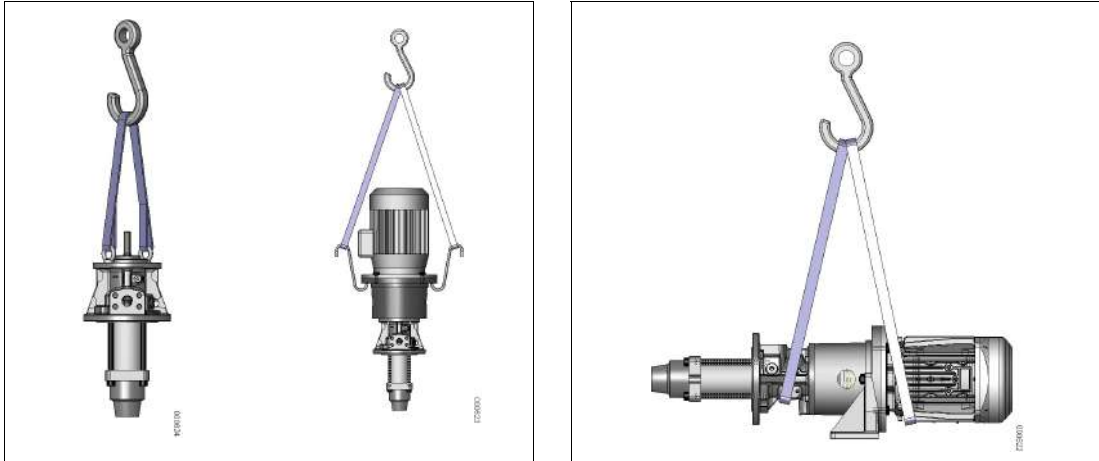


Fig. 1 Raising the pump/motor-driven pump

Prerequisites:

- ☐ Sufficiently dimensioned hoisting equipment
- ☐ The used hoisting equipment conforms to the local regulations and regulations for the prevention of accidents



DANGER

Risk of injury and/or damage to equipment should the pump/motor-driven pump fall.

- ▶ Use intact and correctly dimensioned hoisting equipment.
- ▶ Attach the hoisting equipment in accordance with Figure 1.
- ▶ Do not stand under raised loads.



1. **Pump:** Screw eye bolts into two opposing holes at the flange cover.
Motor-driven pump: Fasten the slinging devices at the motor-driven pump at an angle between 60° and 90°. Ensure that the center of gravity of the motor-driven pump lies between and below the attachment points. If this is not possible, take other suitable measures to prevent the motor-driven pump from tilting.
2. **Pump:** Hang the slinging devices into the eyebolts.
Motor-driven pump: Secure the slinging devices against slipping, for example through screwed-in eye bolts.
3. Hang the crane hook into the slinging device.
4. Raise the pump/motor-driven pump.

Storage

During the test run, the internal components of the pump are wetted with test oil, which has a preservative effect. The pipe connections are fitted with protective caps. Unless otherwise specified, the external components of the pump are preserved with a single-coat PU-based two-component paint. The preservative applied at the factory will protect the pump for about six weeks, if it is stored in a dry and clean location. Adverse ambient conditions, such as high humidity, salty air, etc., will noticeably reduce the possible storage time. If storage over longer periods and in adverse storage conditions is necessary, the pump will have to be preserved.

Preservation

Preservation

Preserving the internal surfaces of the pump



1. Set up the pump so that the pressure-side connection is pointing upward.
 2. Close the suction-side connection of the pump with a cover plate.
 3. Pour non-corrosive, resin-free oil into the pressure flange until the oil reaches the pressure flange and the air bubbles stop rising, while slowly turning the main screw against the direction of rotation.
 4. Close the pressure-side connection of the pump with a cover plate.
- After about 6 months storage check the oil level in the pump and if necessary top up oil.

Preserving the external surfaces of the pump

Aids:

- ☐ Castrol Rustilo DWX 33 or other preservative offering comparable protection



- ▶ Paint or spray the preservative onto all plain and unpainted parts.
- At intervals of about six months, check the preservative effect and if necessary paint or spray the plain und unpainted parts with the preservative again.

Removing the preservative

Aids:

- ☐ Solvents such as diesel fuel, alcohol, industrial cleaner or steam-jet cleaning device with wax-dissolving additives
- ☐ Vessel to collect the preservative oil



1. Clean the outside of the pump with solvents, if necessary using a steam-jet cleaning device.
2. Remove the cover plate on the pressure side.
3. Drain the pump, collecting the preservative oil in a suitable vessel.
4. Remove the cover plate on the suction side.
5. To remove the residual oil, rinse the pump with the pumped liquid.

Safety instruction for disposal



WARNING

Danger of poisoning and damage to the environment through pumped liquid or oil!

- ▶ Wear protective clothing during all the work on the pump.
- ▶ Before disposing of the pump, collect the discharging pumped liquid and oil or grease and dispose of it in accordance with the locally applicable regulations.
- ▶ Before disposing of the pump neutralize the residues of the pumped liquid in the pump.

- ▶ Observe the local regulations on disposal.

Disposing of the pump

Aids:

- ☐ Solvents or industrial cleaners suitable for the pumped liquid



1. Disassemble the pump.
2. Clean residues of the pumped liquid from the individual parts.
3. Separate sealing elements made of elastomers and ceramics (SiC) from the pump and dispose of them in the residual waste.
4. Recycle iron parts.

Installation

Installing the pump

KRAL pumps of the W series can be used vertically in any position. Operation in the horizontal position requires that the pressure connection of the pump is oriented upward, see Fig. 2, Page 15. W-pumps can be supplied for dry or wet installation. A mounting flange has already been provided for vertical wet installation.

We also recommend that the pump should not be mounted above the motor, since pumped liquid can ingress the motor if a leak occurs.

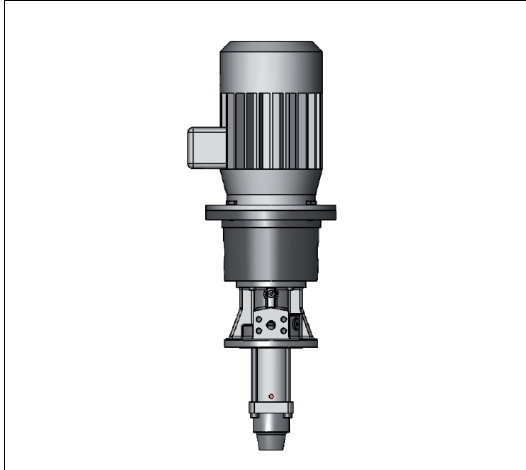


Fig. 1 Vertical installation

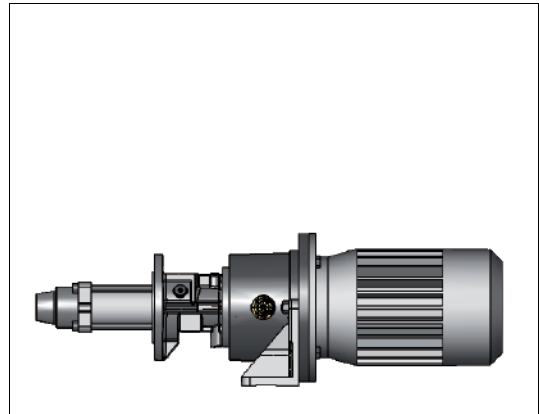


Fig. 2 Horizontal installation

Prerequisite:

- ☐ The pump connections are to be protected against soiling, for example by using the protective cover mounted in the factory



WARNING

Leaking pumped liquid can damage the motor.

- ▶ Do not mount the pump above the motor.



WARNING

Damage to the pump and piping through insufficient fastening.

- ▶ Only fasten the pump on a stable bearing underground.
- ▶ Ensure that fastening elements are fastened sufficiently.



1. Bring the pump into position.
2. Fasten the fastening elements on the underground.

Installation

Protect the pump against soiling



WARNING

Damage through impurities in the piping system.

- ▶ During welding work attach cover plates in front of the connecting flanges.
- ▶ Ensure when welding that welding beads and abrasive dust cannot get into the piping system and the pump.

- ▶ Carefully clean the piping system.

If the piping system is to be flushed out with the pump during commissioning, the pump must be protected by a start-up filter to stop particles of dust getting inside see "Cleaning the piping system", Page 20.

Mesh width of the commissioning filter:

- ☐ 0.025 mm

Connecting the pump to the piping system

The pump connection to the piping system must be stress-free, as otherwise there is no guarantee that the pump will operate safely.

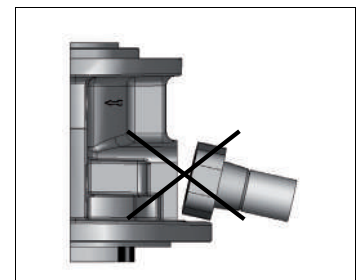
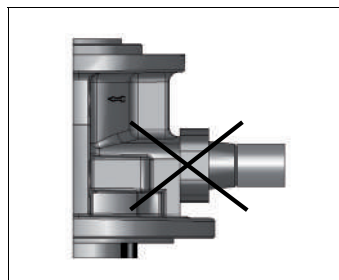
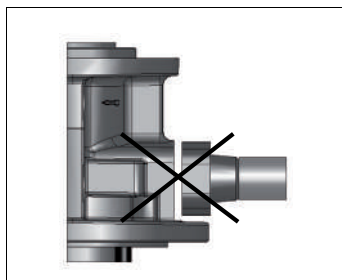


Fig. 3 Incorrect flange connections

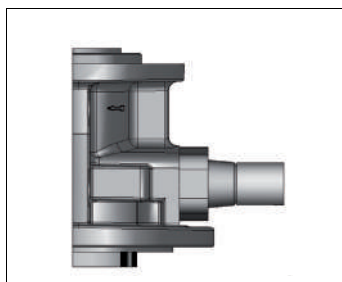


Fig. 4 Correct flange connection



WARNING

Danger of damage to the device or impaired functionality through mechanical stresses.

- ▶ Ensure that the pump mounting on the piping system is free of mechanical stress.

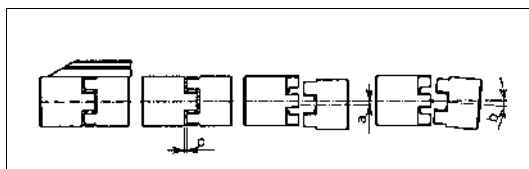


1. Turn the pump shaft or the fan impeller of the motor. This tests that the pump runs smoothly.
If the pump cannot be turned by hand, remedy the fault before installing the pump, see "Troubleshooting", Page 33.
2. If piping has to be adapted, attach cover plates in front of the connecting flanges when welding.
3. Place the piping in position.
4. Support the weight of the piping.
5. Check the clearance and the angular, vertical and linear offset, adjusting where necessary.
If the screws tighten easily, this is a sure sign that the installation is stress-free.
6. Tighten the connecting bolts in an alternating fashion using the correct tightening torque, see Tab. 1, Page 38.

Aligning and checking the shaft coupling

Prerequisites:

- ☐ Pump, shaft coupling and motor have been mounted by the customer



- a** Lateral offset
- b** Angular offset
- c** Linear offset

Fig. 5 Measuring points for tolerances of the coupling alignment

Coupling diameter [mm]	Lateral offset a max. [mm]	Angular offset b max. [°]	Linear offset c	
			min. [mm]	max. [mm]
40	0.2	0.9	2	3
55	0.2	0.9	2	3.5
65	0.25	0.9	2.5	4
80	0.3	1.0	3	4.5
95	0.3	1.0	3	5
120	0.4	1.1	4	6
135	0.4	1.2	4.5	7
160	0.5	1.2	5	8

Tab. 1 Limits for aligning the shaft coupling



CAUTION

Incorrect alignment of the shaft coupling causes noise, vibrations and damage to the bearing.

- Check the alignment of the coupling.



1. Check the linear offset **c** of the coupling using a slide gauge or feeler gauge.
If the limits of the above table are exceeded, loosen the fastening of the pump or motor and move the device in order to adjust the linear offset **c**.
2. Check the lateral offset **a** of the coupling using a hairline gauge and feeler gauge. Check several points along the periphery of the coupling.
If the limits of the above table are exceeded, loosen the fastening of the pump or motor and move the device in order to reduce the lateral offset **a**.
3. Check the angular offset **b** of the coupling using a hairline gauge.
If the limits of the above table are exceeded, loosen the fastening of the pump or motor and move the device in order to reduce the angular offset **b**.

Electrical connection

Electrical connection

Connecting the pump

Prerequisite:

- ☐ Sufficiently dimensioned cables



DANGER

Risk of death resulting from electric shock.

- ▶ The pump may only be connected by an authorized electrician.
- ▶ Ensure that the power supply is de-energized.
- ▶ Ground the pump carefully.



1. Observe the operating instructions of the premounted motor.
2. If the motor is supplied separately from the pump, connect the motor in accordance with the operating instructions of the motor.
3. Ensure that the operating data on the rating plate of the motor agree with the operating data of the pump.
4. Ensure that the operating data on the rating plate of the motor agree with the local power supply.
5. Open the terminal box at the motor.
6. Ensure that the connecting cable is not live.
7. Connect the phase and PEN conductors in accordance with the diagram in the motor terminal box.
8. Close the terminal box of the motor.

Removing the pump

Removing the pump

Prerequisite:

- ☐ Pump is switched off

Aids:

- ☐ Vessels for leaking pumped liquid



DANGER

Risk of death resulting from electric shock.

- ▶ Ensure that the power supply is de-energized.
- ▶ The pump may only be separated from the power supply by an authorized electrician.



DANGER

Risk of injury through emitted hot, poisonous or corrosive pumped liquid when removing the pump.

- ▶ Observe the safety regulations for handling dangerous liquids.

Removing the pump



1. In case of operation at higher temperatures wait until the motor-driven pump has cooled down to the ambient temperature.
2. Disconnect the pump from the power supply.
3. Open the terminal box at the motor.
4. Disconnect the connecting cable.
5. Close the pressure-side and suction-side shut-off fittings.
6. Loosen the connecting screws of the pressure-side pipe connection. Collect the emitted liquid in a suitable vessel.
7. After the liquid has been drained completely, dismantle the pressure-side flange.
8. Loosen the connecting screws of the suction-side pipe connection. Collect the emitted liquid in a suitable vessel.
9. After the liquid has been drained completely, dismantle the suction-side flange.
10. Loosen the fastening of the motor-driven pump on the foundation.
11. Dismantle the motor and pump bracket.

Commissioning

Commissioning

Safety instructions for commissioning

The following instructions must always be observed.

- ▶ The pump may only be commissioned by authorized qualified personnel.
- ▶ Before commissioning, make sure that the pump is filled.

Protect the pump against soiling

The pump has to be protected against soiling during commissioning.

Possibilities:

- ☐ Clean dirt particles from the piping system before initial commissioning.
- ☐ Install additional commissioning filter.

Cleaning the piping system

The complete piping system has to be cleaned diligently before initial commissioning of the pump. If this is to be realized by rinsing using the pump, an additional commissioning filter has to be installed before the pump.

Mesh width of the commissioning filter:

- ☐ 0,025 mm



CAUTION

Damage to the pump through additional pressure loss in the commissioning filter.

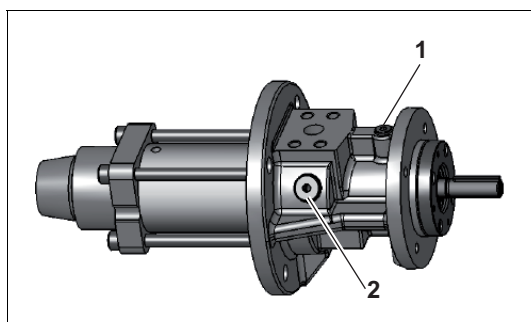
- ▶ Calculate the flow resistance and determine the remaining pump intake.
- ▶ Monitor the suction-side pressure.
- ▶ Check and clean the commissioning filter regularly.

- ▶ Recommended rinsing duration with commissioning filter: 50 – 100 hours

Filling and venting the pump

There are 2 possible ways to fill the pump:

- ☐ Pumped liquid already exists on the suction or pressure side:
Filling via suction or pressure connection
- ☐ There ist no pumped liquid at the suction or pressure side:
Filling via the bypass connection



- 1 Seal vent hole
- 2 Bypass connection

Fig. 1 Vent holes

Commissioning



DANGER

Risk of death through emitted pumped liquid.

Pumped liquids can be hot, poisonous or caustic and can spray out under high pressure.

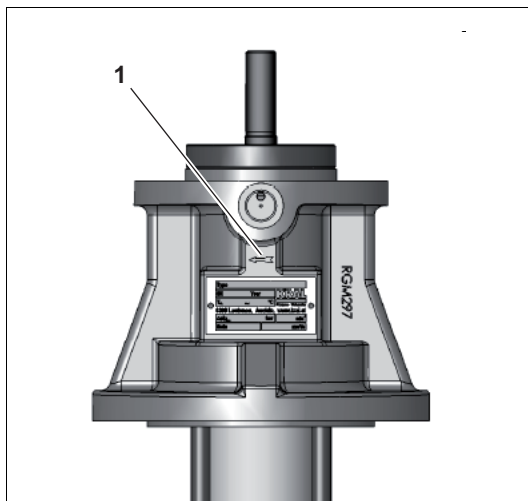
- ▶ Wear protective clothing during all the work. Ensure face protection.
- ▶ Collect the emitted pumped liquid safely and dispose of it in an environmentally compatible manner.



1. Loosen the screw plug of a vent hole **1** at the pump housing by a max. of 2 rotations so that the air can escape during the filling process.
2. If the pumped liquid on the suction side is under inlet pressure, open the shut-off device on the suction side and fill the pump. Turn the pump shaft or the fan impeller of the motor by hand to speed up the filling process.
 - or -
 - ▶ If the pumped liquid is already available on the pressure side, open the shut-off device on the pressure side and fill the pump. Turn the pump shaft or the fan impeller of the motor by hand to speed up the filling process.
 - or -
 - ▶ If there is no pumped liquid at either the pressure or the suction side flange, remove the screw plug of the bypass connection **2** and fill the pump via the bypass connection. Turn the pump shaft or the fan impeller by hand to speed up the filling process. Fill the pump until pumped liquid escapes at the bypass hole **2**. Tighten the screw plug of the bypass connection **2** again.
3. Wait until the liquid escapes at the vent hole **1**.
4. Tighten the screw plug of the vent hole **1** again.

Checking the direction of rotation

The direction of rotation is indicated by an arrow on the pump. The direction of rotation of the motor gives the direction of rotation of the pump. That is to say, the fan impeller of the motor must rotate in the direction in which the arrow on the pump is pointing to indicate direction of rotation. Normally the direction of rotation of the pump is to the right (clockwise), as seen from the motor side.



1 Rotation-direction arrow

Fig. 2 Indication of rotation direction

Commissioning

Prerequisite:

- ☐ Pump securely fastened
- ☐ Pump connection to the piping system is free of stress
- ☐ Pump motor is connected correctly to the electrical power supply
- ☐ Piping system is free of contamination
- ☐ A commissioning filter of the prescribed mesh width is fitted if the piping system is to be cleaned by the pump
- ☐ Pump is filled



WARNING

Dry running can damage pump equipment.

- ▶ Switch the pump on (for max. 1 sec.) and then off again immediately (checking the direction of rotation).



1. Switch on the power supply and then turn it off again immediately.
2. When the fan impeller of the motor moves slowly after switching off, compare the direction of rotation of the fan impeller with the arrow indicating direction of rotation on the pump flange. If the directions do not match, swap over two electrical connection phases. Repeat Steps 1–2.

Initial commissioning the pump

Prerequisite:

- ☐ The ambient conditions correspond to the operating data, see "Technical data", Page 6
- ☐ Pump securely fastened
- ☐ Pump connection to the piping system is free of stress
- ☐ The pump motor is connected correctly to the electrical power supply
- ☐ Piping system is free of contamination
- ☐ A commissioning filter of the prescribed mesh width is fitted if the piping system is to be cleaned by the pump
- ☐ Pump is filled
- ☐ If there are shut-off devices in the suction and pressure pipes, they are open



WARNING

Dry running can damage pump equipment

- ▶ Before initial commissioning the pump, observe these operating instructions.
- ▶ Before initial commissioning the pump, make sure that it is filled.
- ▶ If the pump does not deliver after 10–15 seconds, abort initial commissioning.



1. Switch on the pump.
The pump will deliver when the pressure on the pressure side of the pump rises or when a flow indicator available at the plant responds.
2. If the pump does not deliver after 10–15 seconds of operation, abort initial commissioning, establish the cause of the fault and only then continue the commissioning procedure. Follow the instructions in the fault table, see "Troubleshooting", Page 33.
3. Run the pump for a few minutes to allow the piping system to vent fully.
The piping system is fully vented when there is a smooth operating noise and a pressure gauge on the pressure side of the pump shows no more fluctuations.

During operation

During operation

Checking the operating pressure

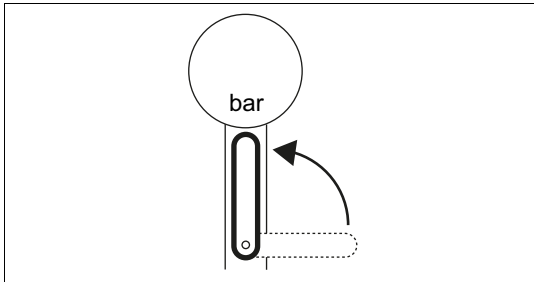


Fig. 3 Schematic diagram:
Open pressure gauge stopcock

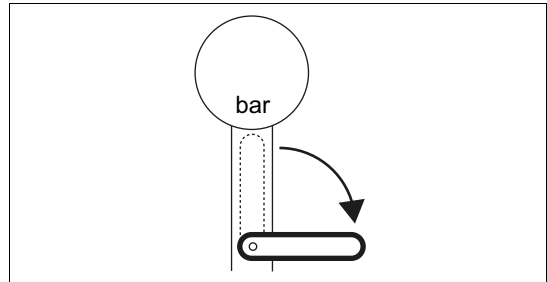


Fig. 4 Schematic diagram:
Close pressure gauge stopcock



Pressure gauge stopcocks that are opened permanently can result in the pressure gauges leaking.

- ▶ Close the pressure gauge stopcocks after completing reading.



- ▶ Open the pressure gauge stopcock, read the operating pressure, close the pressure gauge stopcock.

Switching off the pump

Prerequisite:

- ☐ Pump taken into operation



WARNING

Pressurizing the pump while it is at a standstill may damage the pump seals.

- ▶ Ensure that while the pump is at a standstill, the pressure in the pump does not exceed the inlet pressure during operation.



1. Disconnect the motor from the power supply.
2. If there is no return valve fitted in the pressure pipe, close the shut-off device on the pressure side.

Resuming pump operation

Prerequisite:

- ☐ A return valve incorporated in the suction pipe, if it is possible to drain the suction pipe when the pump is at a standstill
- ☐ The requirements for initial commissioning are met, see "Initial commissioning the pump", Page 22.



WARNING

Dry running can damage pump equipment.

- ▶ Before commissioning, make sure that the pump is filled.



- ▶ Switch on the pump.
Under the requirements mentioned above, the pump is ready for operation at any time.

Maintenance

Required maintenance

The service life of the pump depends to a great extent on the operating conditions of the pump. If the operating limits are observed, see "Technical data", Page 6, the pump has a service life of many years. Signs of progressive wear of individual pump elements:

Finding	Cause	Elimination
Increased running noises	Incipient damage to bearing	Replace the bearing
Increased leaking	Incipient damage to seal	Replace the shaft seal
Deposits on the seal	Non-volatile liquids	Clean the seal
Increased play in the shaft coupling	Advanced wear of the coupling intermediate ring	Replace the spacer ring
Reduction in the flow rate or pressure under constant operating conditions	Advanced wear of screws and casing	Replace screws and casing

Tab. 1 Check table for required maintenance



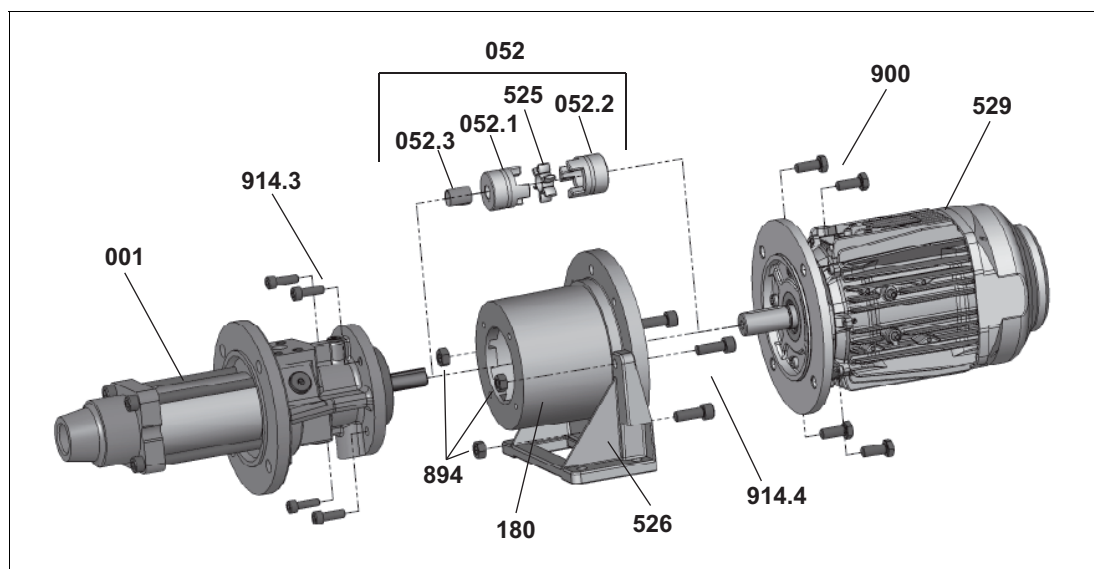
1. Check the pump visually and acoustically every 4 weeks.
2. Check for signs of premature wear as listed in the table above and eliminate the cause.

Maintaining the ball bearing

The ball bearings used are lifetime lubricated. Maintenance work is not required.

Replacing the coupling

General drawing



001	Pump	526	Pump bracket pedestal
052	Coupling complete	529	Motor
052.1	Pump-side coupling half	894	Hexagon nuts
052.2	Motor-side coupling half	900	Hexagon screws
052.3	Distance sleeve	914.3	Socket screws
180	Pump bracket	914.4	Socket screws
525	Coupling intermediate ring		

Replacing the coupling

Removing the torsionally elastic coupling

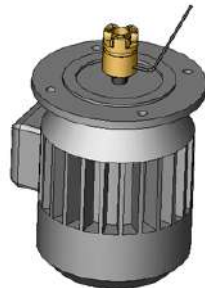
Prerequisite:

- ☐ Pump dismantled, see "Removing the pump", Page 18

1. Before starting to dismantle, use suitable covers to protect the inlet and outlets opening of the pump against solid particles and soiling.



2. Loosen the connecting screws **900** between the motor **529** and the pump bracket **180** and remove the pump **001** with the pump bracket from the motor.



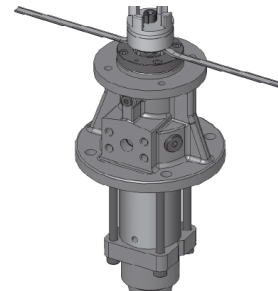
3. Loosen the fixing screw on the motor-side coupling half **052.2**.



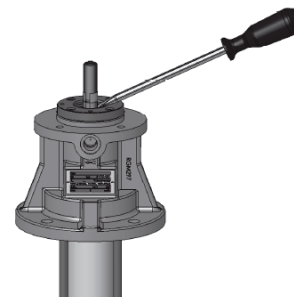
4. Pull off the coupling half **052.2** using a suitable device.



5. Loosen the connecting screws **914.3** between the pump **001** and the pump bracket **180** and remove the pump bracket with pump bracket pedestal **526** from the pump.



6. Loosen the fixing screw on the pump-side coupling half **052.1** and remove the coupling halves using suitable mounting levers.



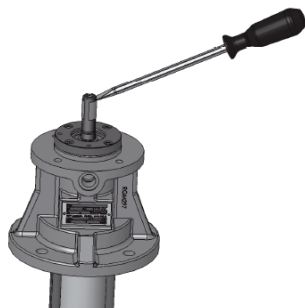
7. Remove the distance sleeve **052.3** of the coupling from the shaft.

Replacing the coupling

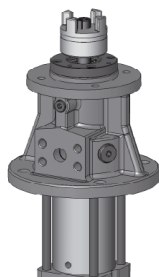
Installing the torsionally elastic coupling

Prerequisite

- ☐ Replacement coupling available



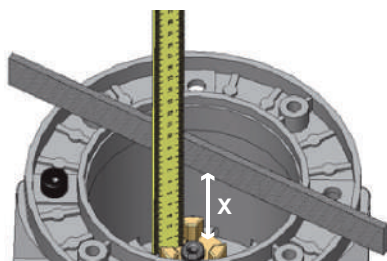
1. Slide the distance sleeve **052.3** of the coupling flush onto the circlip of the bearing.



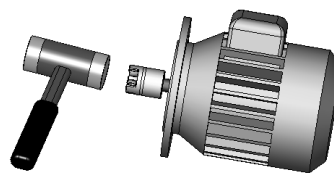
2. Slide the pump-side coupling half **052.1** onto the shaft until the distance sleeve **052.3**. Heating the coupling to 80 °C - 100 °C facilitates mounting. Tighten the fixing screw of the coupling half.



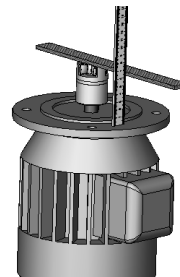
3. Place the pump bracket **180** with the pump bracket pedestal **526** on the pump and tighten the connecting screws **914.3** between the pump and pump bracket.



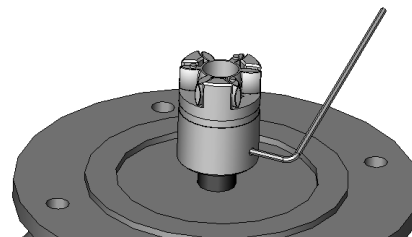
4. Measure the distance X between the face of the coupling and the connecting surface of the pump bracket.



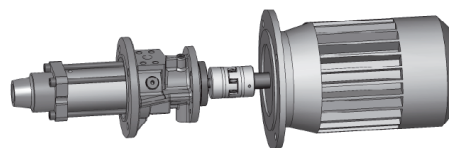
5. Use light blows with a soft hammer to mount the motor-side coupling **052.2** on the shaft end of the motor. Heating the coupling to 80 °C - 100 °C facilitates mounting.



6. Check the distance between the face of the coupling teeth and the connecting surface of motor flange. The distance has to be adjusted to the value X - c (see Tab. 1, Page 17).



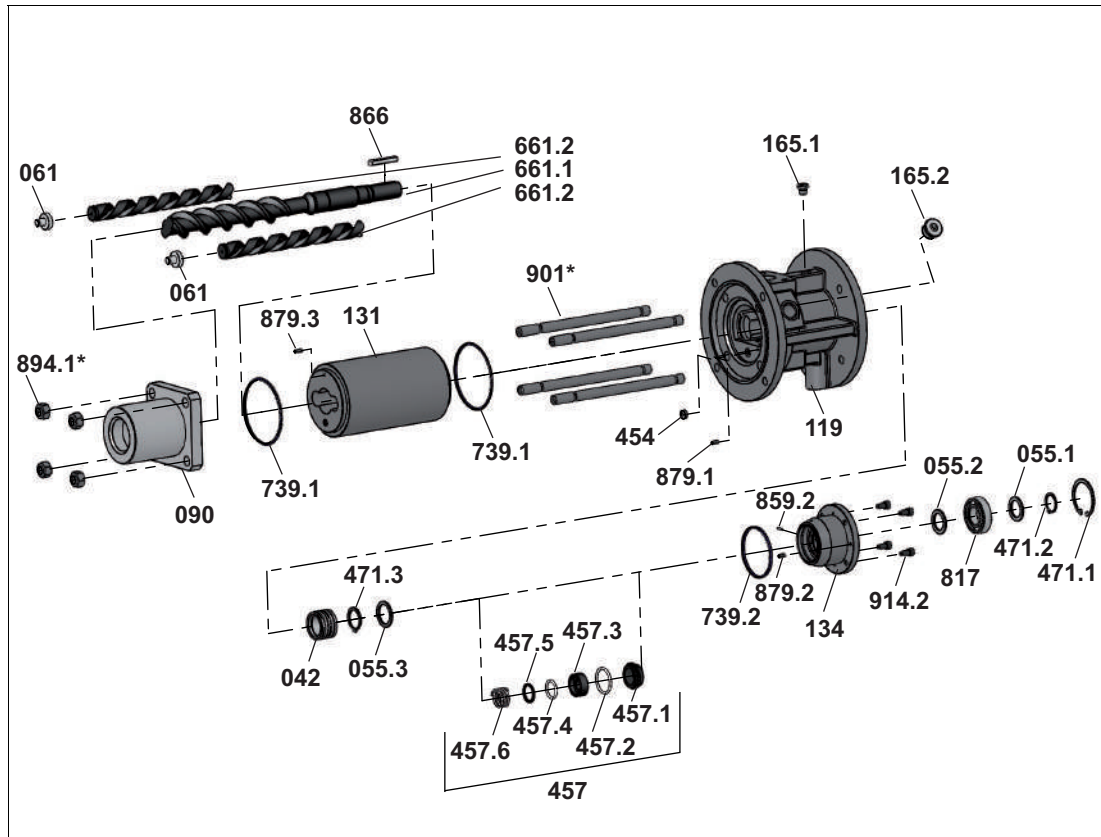
7. Insert the elastic coupling intermediate ring **525** and tighten the fixing screw at the coupling half **052.2**.
8. Place the pump with the pump bracket on the motor.



9. Turn the pump slightly until the teeth of the pump-side coupling half **052.1** meshes correctly into the spaces of the coupling intermediate ring **525** (fig. without pump bracket).
10. Tighten the connecting screws **900** between the motor and pump bracket, see Tab. 1, Page 38.
11. Do not remove the protective caps until just before reconnecting the pump to the piping system.

Replacing the mechanical seal and ball bearing

Replacing the mechanical seal and ball bearing



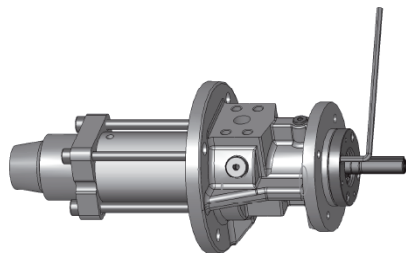
042	Balancing cylinder	457.6	Spring
055.1	Supporting ring	471.1	Circlip
055.2	Supporting ring	471.2	Circlip
055.3	Supporting ring	471.3	Circlip
061	Thrust washer	661.1	Main screw
090	Suction cover	661.2	Idle screw
119	Pressure casing	739.1	O-ring
131	Pump casing	739.2	O-ring
134	Seal casing	817	Ball bearing
165.1	Screw plug	859.2	Dowel pin
165.2	Screw plug	866	Feather key
454	Edge seal	879.1	Straight pin
457	Mechanical seal	879.2	Straight pin
457.1	O-ring	879.3	Straight pin
457.2	Counter ring	894.1*	Hexagon nuts
457.3	Rotating ring	901*	Stud screws
457.4	O-ring	914.2	Socket screws
457.5	Thrust ring		

* only for Sizes 55–118;

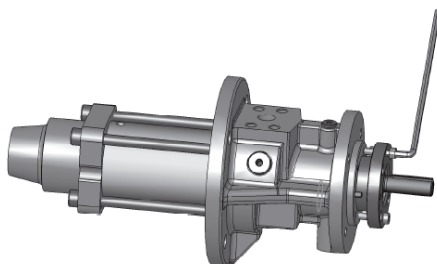
Sizes 15–42: replaced by 4 socket screws

Replacing the mechanical seal and ball bearing

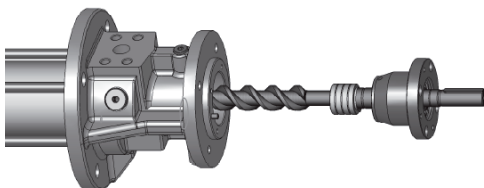
Removal of mechanical seal and ball bearing



1. Remove the socket screws **914.2**.



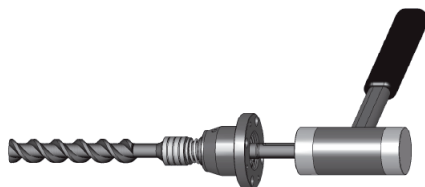
2. Screw in the pulling-off screw. In the process the seal casing **134** is pressed out of the pressure casing **119** together with the main screw and mounted mechanical seal.



3. Draw the seal casing **134** out of the pressure casing **119** together with the main screw and mounted mechanical seal.



4. Remove the feather key **866**. Dismantle the circlips **471.1** and **471.2** and supporting ring **055.1**.



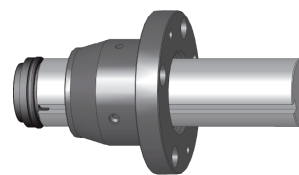
5. Drive the main screw **661.1** out of the seal casing **134** with light blows from a soft face hammer.



6. Dismantle the supporting ring **055.2**, parts of the mechanical seal **457** and supporting ring **055.3** from the main screw.



7. Pull the ball bearing **817** out of the seal casing **134** with a suitable pulling-off device.

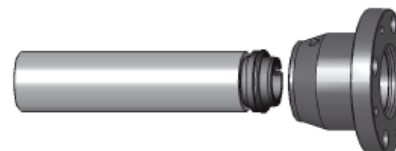


8. Use a suitable rod to press the counter ring of the mechanical seal **457.2** with the mounted O-ring **457.1** out of the seal casing **134**.

Installation of mechanical seal and ball bearing

Prerequisite:

- ☐ Replacement parts available

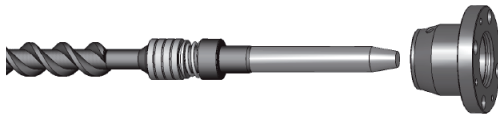


1. Use a suitable rod to press the counter ring of the mechanical seal **457.2** with the mounted O-ring **457.1** into the seal casing **134**. Take the position of the clearance for the dowel pin.

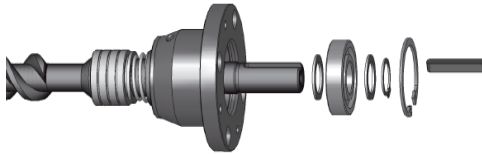


2. Clean the main screw around the mechanical seal carefully and grease it. Push the supporting ring **055.3** and the remaining part of the mechanical seal **457** onto the shaft. Use the mounting sleeve in the process.

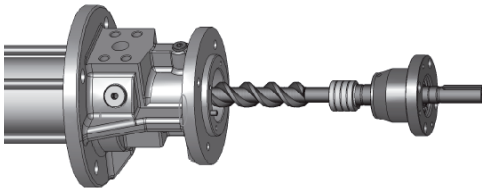
Replacing the screw set



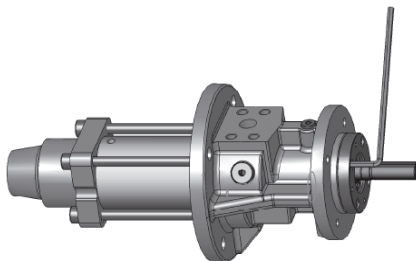
3. Push the main screw with the mounted mechanical seal into the seal casing **134**. Use the mounting sleeve in the process.



4. Remove the mounting sleeve. Mount the supporting ring **055.2**, press on the ball bearing **817**. Mount the supporting ring **055.1**, circlips **471.2** and **471.1** and feather key **866**.
5. Carefully clean the slide surfaces of the rotating ring **457.3*** and counter ring **457.2*** in the pressure casing using cleaning spirit and then administer a drop of resin-free lubricating oil. Do not touch the slide surfaces afterwards.



6. Push the main screw **661.1** with the premounted seal casing **134** into the pressure casing **119**.



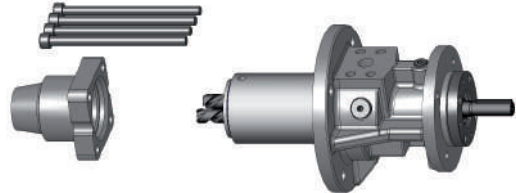
7. Tighten the socket screws **914.2** with the torque.
Tightening torque see Tab. 1, Page 38.

Replacing the screw set

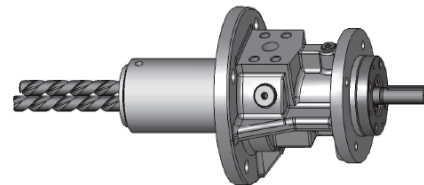
Removing the screw set

Prerequisite:

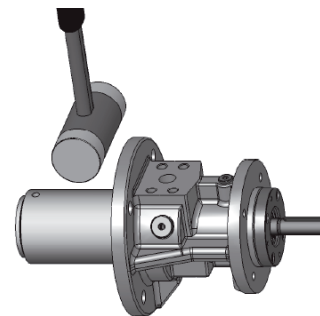
- ☐ Pump dismantled, see "Removing the pump", Page 18.



1. Sizes 15–42: Screw out the four socket screws **914.1** and remove the suction cover **090**.
Sizes 55–118: Remove the hexagon nuts **894.1** and stud screws **901** and suction cover. The figure shows Sizes 15–42.



2. Remove the idle screws **661.2** from the screw casing **131**.



3. Loosen the pump casing **131** with light blows from a soft hammer and pull it off.
4. Following removal steps see "Removal of mechanical seal and ball bearing", Page 28, Steps 1–5.



5. Dismantle the supporting ring **055.2**, parts of the mechanical seal **457**, supporting ring **055.3**, circlip **471.3** and balancing cylinder **042** from the main screw.

Replacing the screw set

Installing the screw set

Prerequisite:

- ☐ Replacement parts available



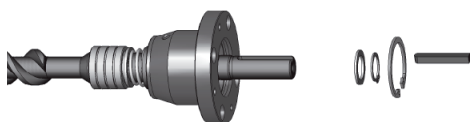
1. Press the balancing cylinder **042** onto the main screw, mount the circlip **471.3**.



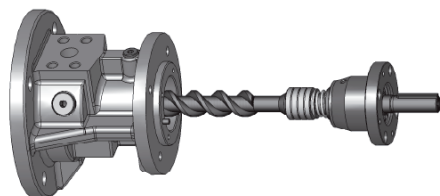
2. Clean the main screw around the mechanical seal carefully and grease it. Push the supporting ring **055.3** and the remaining part of the mechanical seal **457** onto the shaft. Use the mounting sleeve in the process.



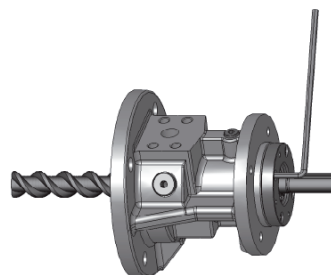
3. Push the main screw with the mounted mechanical seal into the seal casing **134**. Use the mounting sleeve in the process.



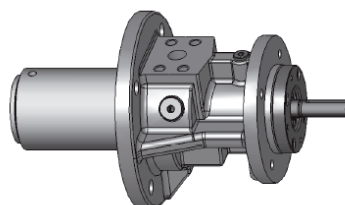
4. Remove the mounting sleeve. Mount the supporting ring **055.1**, circlips **471.2** and **471.1** and feather key **866**.
5. Carefully clean the slide surfaces of the rotating ring **457.3*** and counter ring **457.2*** in the pressure casing using cleaning spirit and then administer a drop of resin-free lubricating oil. Do not touch the slide surfaces afterwards.



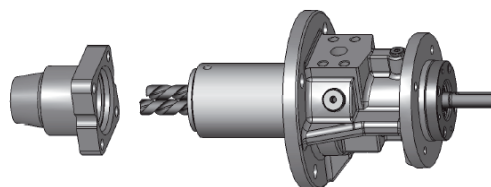
6. Push the main screw **661.1** with the premounted seal casing **134** into the pressure casing **119**.



7. Tighten the socket screws **914.2**, see Tab. 1, Page 38.



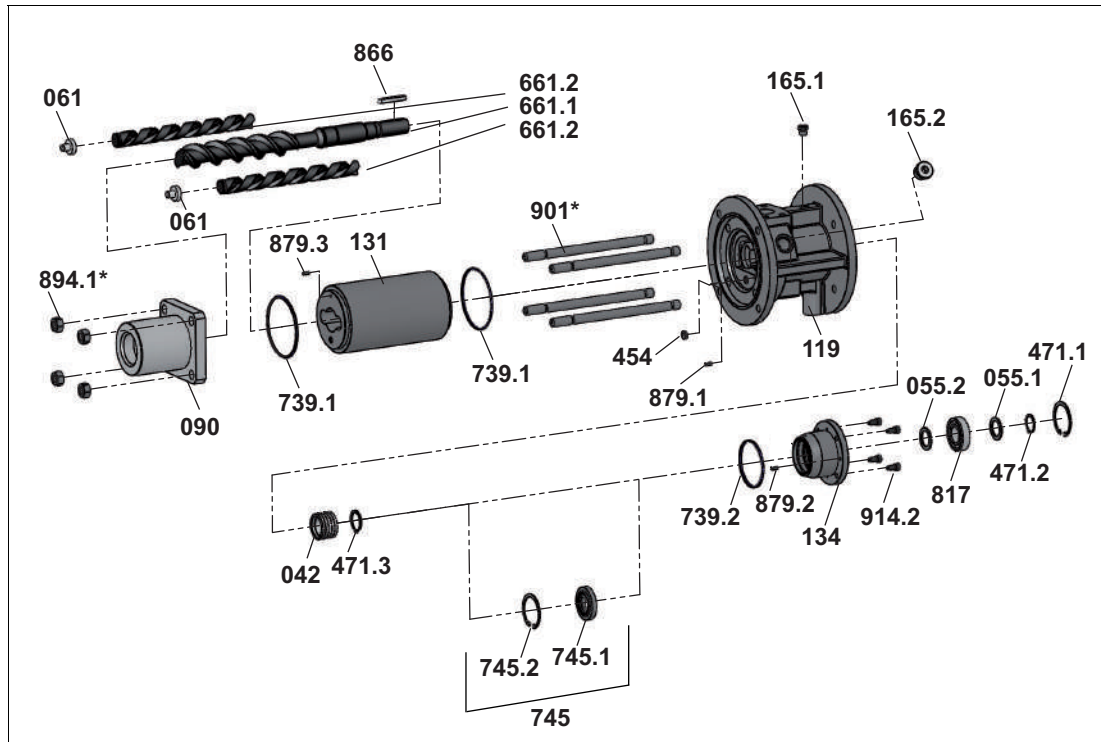
8. Slide the unit out of the pressure casing **119** and main screw into the screw casing **131**.



9. Push the idle screws **661.2** into the screw casing. Set the suction cover **090** in place, Sizes 15–42: Tighten the socket screws **914.1**, see Tab. 1, Page 38.
Sizes 55–118: Mount the stud screws **901** and hexagon nuts **894.1** and tighten with the correct torque, see Tab. 1, Page 38.

Replacing the Domsel type radial shaft seal

Replacing the Domsel type radial shaft seal



042	Balancing cylinder	661.2	Idle screw
055.1	Supporting ring	739.1	O-ring
055.2	Supporting ring	739.2	O-ring
061	Thrust washer	745	Radial shaft seal
090	Suction cover	745.1	Radial shaft seal
119	Pressure casing	745.2	Circlip
131	Pump casing	817	Ball bearing
134	Seal casing	859.2	Dowel pin
165.1	Screw plug	866	Feather key
165.2	Screw plug	879.1	Straight pin
454	Edge seal	879.2	Straight pin
471.1	Circlip	879.3	Straight pin
471.2	Circlip	894.1*	Hexagon nuts
471.3	Circlip	901*	Stud screws
661.1	Main screw	914.2	Socket screws

* only for Sizes 55–118;

Sizes 15–42: replaced by 4 socket screws

Replacing the Domsel type radial shaft seal

Removing the radial shaft seal

Prerequisite:

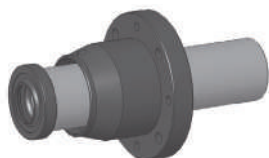
- ☐ Pump disassembled, see "Replacing the mechanical seal and ball bearing", Page 27, removal steps 1–5



1. Pull the ball bearing **817** out of the seal casing **134** with a suitable pulling-off device.



2. Remove the supporting ring **055.2** and circlip **745.2** from the seal casing.

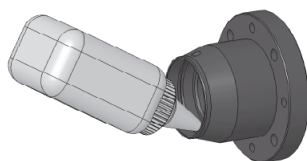


3. Use a suitable rod to press the radial shaft seal **745.1** out of the seal casing. As a rule the seal ring is destroyed during dismantling.

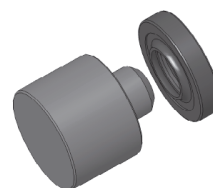
Installing the radial shaft seal

Prerequisite:

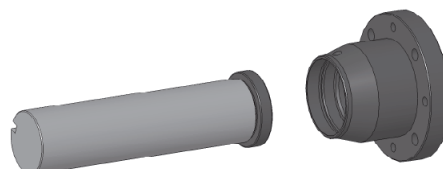
- ☐ Replacement seal ring available



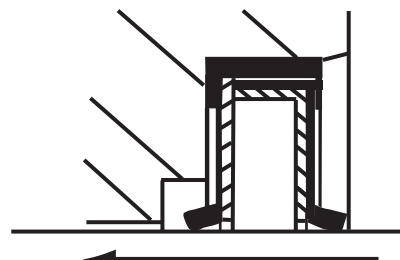
1. Clean the seating of the seal ring in the seal casing **134** carefully and apply Loctite 572 thread sealant (or a corresponding alternative).
The liquid is used as a lubricant while the seal ring is being mounted, after hardening to prevent rotation.



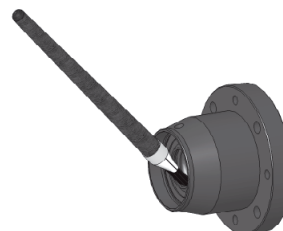
2. Prepare a suitable rod for mounting the seal ring. The rod must lie flat on the support body of the seal ring and may not have any sharp edges in the vicinity of the sealing lip.



3. Use a suitable rod to press the radial shaft seal **745.1** into the seal casing. In case of excessive resistance apply additional thread sealant as a lubricant.



4. Observe the mounting direction of the radial shaft seal.



5. Lubricate the space of the radial shaft seal with a suitable lubricant.



6. Slide the supporting ring **055.3** onto the main screw. Insert the main screw into the seal casing **134** with the premounted seal ring. Use the mounting sleeve in the process.
7. Remove the mounting sleeve. Proceed as described in the chapter "Replacing the mechanical seal and ball bearing", see "Installation of mechanical seal and ball bearing", Page 28, installation steps 4, 6 and 7.

Information about faults

Information about faults

Faults can have different causes. The following tables list the symptoms of a fault, the possible causes and measures for elimination.

Possible faults



Fault	Cause / Elimination
☐ No pump suction	1, 2, 3, 4, 5, 6, 7, 8, 35
☐ Delivery rate too low	2, 3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 17
☐ Pump runs noisily	2, 3, 4, 6, 10, 11, 13, 15, 19, 20, 21, 22, 23
☐ Motor overload	9, 11, 14, 23, 24
☐ Uneven delivery rate	2, 3, 4, 6, 11, 13, 15, 16
☐ Leaking shaft seal	18, 25, 26, 27, 28, 29, 30
☐ Pump has got stuck	31, 32, 33, 34

Troubleshooting



No.	Cause	Remedy
1	Pump suction pipe closed	► Check shut-off devices in the suction pipe and open them, if necessary.
2	Suction valve or pipe obstructed	► Check the suction valve and pipe for clear passage.
3	Suction pipe or shaft seal leaks	► Check suction pipe or shaft seal for leaks. Pay particular attention to leakage at valves and connection points. If necessary, replace parts.
4	Suction head too high	► Reduce difference of level - or - ► Reduce pipe length - or - ► Increase pipe diameter - or - ► Heat the liquid to reduce viscosity - or - ► Install suction filter with greater mesh width. Ensure that the permissible mesh width is not exceeded, see "Protect the pump against soiling", Page 16.
5	Level of liquid in the intake container too low	► Top up the pumped liquid.
6	Filter soiled	► Clean the filter.
7	Pump intake capacity reduced by inadequate wetting	► Fill pump with liquid.
8	Incorrect pump rotation direction	► Make the electrical connection such that the direction of pump rotation matches that of the arrow on the flange cover.
9	Differential pressure too high	► Check the installation and reduce the differential pressure.
10	Magnetic coupling broken off	1. Stop the pump and restart it 2. Avoid excessive differential pressures. 3. At repeated occurrence check whether pump has got stuck.

Information about faults

No.	Cause	Remedy
11	Viscosity of the pumped liquid too high	► Increase the temperature of the liquid - or - ► Reduce the rotation speed.
12	Viscosity of the pumped liquid too low	► Decrease the temperature of the liquid - or - ► Increase the rotation speed.
13	Airlock or gas in the liquid	1. Test the piping system for air admission and replace parts if necessary. 2. Reduce the suction head - or - ► Increase the inlet pressure.
14	Motor running at wrong voltage or frequency	1. Ensure that the motor voltage and frequency match the operating voltage. 2. Compare the speed of the motor with the pump rating plate. If the data do not match, adjust the speed of the motor.
15	Overflow valve opens during normal operation	► Set opening pressure above value of operating pressure.
16	Overflow valve leaks	► Clean the overflow valve and if necessary, reseal.
17	Advanced wear of rotating pump components	► Check screw set and casing and replace if necessary.
18	Advanced wear of sealing surfaces	► Replace the seal and check the pumped liquid for abrasive content.
19	Inadequate alignment of shaft coupling	► Align the shaft coupling correctly, see "Aligning and checking the shaft coupling", Page 17.
20	Pump deflected	1. Support the weight of the piping. 2. Loosen piping connections and mount stress-free, see "Connecting the pump to the piping system", Page 16.
21	Resonance in the installation	► Provide a flexible bearing arrangement for the motor-driven pump - or - ► Make the connections with hoses.
22	Speed of flow in suction or pressure pipe too high	1. Set the flow speed in the suction pipe so that it does not exceed 1 m/s. 2. Set the flow speed in the pressure pipe so that it does not exceed 3 m/s.
23	Ball bearing damaged	► Replace the ball bearing, see "Replacing the mechanical seal and ball bearing", Page 27.
24	Lack of lubrication or foreign bodies have caused superficial damage to rotating pump components	► Check the screw set and the casing or replace the pump with free shaft end.
25	Dry running has damaged the shaft seal	► Replace the shaft seal, see "Repairs", Page 24.
26	Inlet pressure too high	► Reduce the inlet pressure at the installation.
27	Thermal or chemical loading of elastomer seals exceeded	1. Check the maximum operating temperature. 2. Check the resistance of the elastomers with regard to the pumped liquid.

No.	Cause	Remedy
28	Cold start when delivering high-viscosity liquids	► Install a pump heating.
29	Seal overload during heating process	► To prevent thermal expansion of the liquid causing a build-up of pressure, open the pressure- or suction-side shut-off devices.
30	Leaking return valve causes seal overload when pump is at a standstill	► Clean the return valve and if necessary, replace it.
31	Foreign bodies in the pump	1. Dismantle the pump and clean it. 2. Smooth the superficial damage to the casing and the rotating parts with an oilstone and if necessary, replace the screw set and/or the casing.
32	Differential pressure is too high and has overloaded the sleeve bearing	1. Dismantle the pump and clean it. 2. Smooth the superficial damage to the casing and the rotating parts with an oilstone and if necessary, replace the screw set and/or the casing. 3. Reduce the differential pressure.
33	Viscosity is too low and has overloaded the sleeve bearing	1. Dismantle the pump and clean it. 2. Smooth the superficial damage to the casing and the rotating parts with an oilstone and if necessary, replace the pump with free shaft end. 3. Increase the viscosity, for example by reducing the operating temperature.
34	Dry running can damage the pump	1. Dismantle the pump and clean it. 2. Smooth the superficial damage to the casing and the rotating parts with an oilstone and if necessary, replace the pump with free shaft end. 3. When resuming operation, take action to prevent dry running, see "Resuming pump operation", Page 23.
35	Pump does not vent	► Vent the pressure pipe at the highest point.

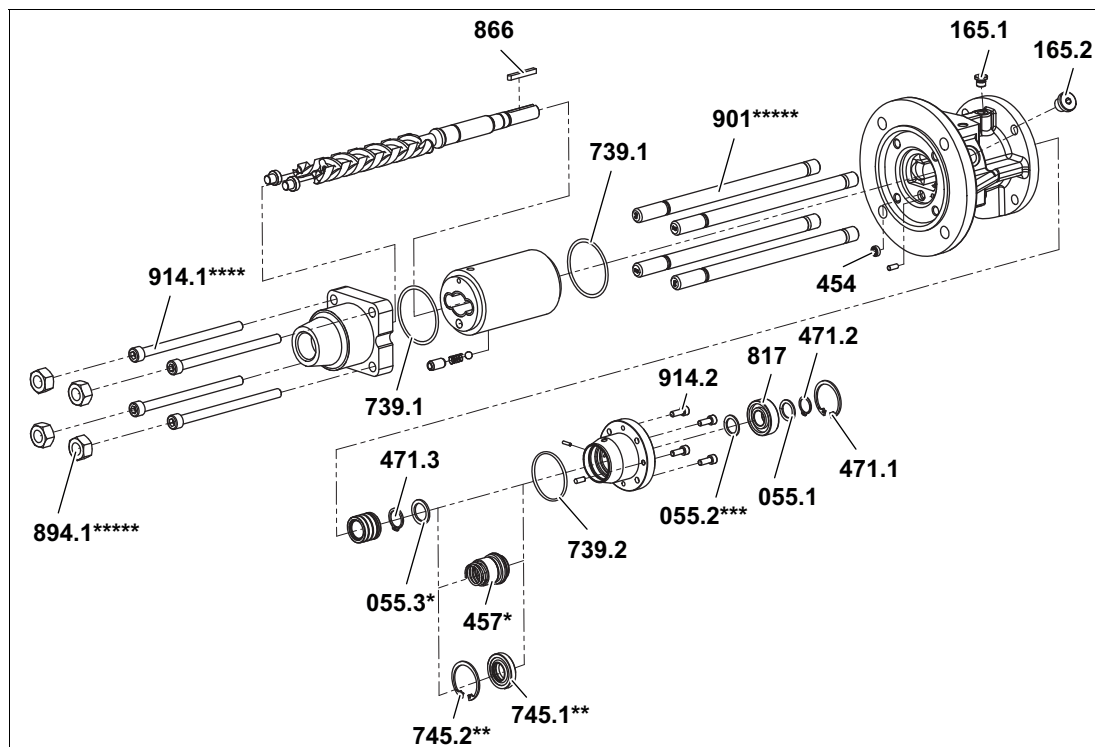
Maintenance kits

Maintenance kits



Notice: The maintenance kits contain only the numbered parts and are only supplied complete.

W 15 – 118



Qty.	Pos. no.	Part	Qty.	Pos. no.	Part
1	055.1	Supporting ring	2	739.1	O-ring
1	055.2***	Supporting ring	1	739.2	O-ring
1	055.3*	Supporting ring	1	745.1**	Radial shaft seal
1	165.1	Screw plug	1	745.2**	Circlip
1	165.2	Screw plug	1	817	Ball bearing
1	454	Edge seal ring	1	866	Feather key
1	457*	Mechanical seal	4	894.1*****	Hexagon nut
1	471.1	Circlip	4	901*****	Stud screw
1	471.2	Circlip	4	914.1****	Socket screw
1	471.3	Circlip	4	914.2	Socket screw
*	Only for mechanical seal				
**	Only for radial shaft seal				
***	Not for W 32 – 42				
****	Only for W 15 – 42				
*****	Only for W 55 – 118				

Tool kits for LFI/LVI/LFT/LVT/LFM/WS

	Stk./Qty.	Teil	Part
	1	Montagedorn Gegenring	<i>Mounting arbor stationary seal ring</i>
	1	Montagehülse Hauptspindel	<i>Mounting sleeve main screw</i>
	1	Montagehülse Kugellager	<i>Mounting sleeve ball bearing</i>

	Stk./Qty.	Teil	Part
	1	Montagedorn Radialwellendichtring	<i>Mounting arbor stationary seal ring</i>
	1	Montagehülse Hauptspindel	<i>Mounting sleeve main screw</i>
	1	Montagehülse Kugellager	<i>Mounting sleeve ball bearing</i>
	1	Positionierhülse	<i>Positioning sleeve</i>

Exploded view diagram of a motor assembly. The components are labeled with part numbers:

- 052 (Main assembly housing)
- 052.1, 052.2, 052.3 (Internal components of the main assembly)
- 914.3 (Front flange assembly)
- 914.4 (Rear flange assembly)
- 900 (Motor unit)
- 894 (Mounting bracket)
- 180 (Base plate)
- 526 (Support bracket)

Pos. no.	Part	Pos. no.	Part
052	Coupling complete	900	Hexagon screw
180	Pump bracket	914.3	Socket screw
526	Pump bracket pedestal	914.4	Socket screw
894	Hexagon nut		

Tightening torques

Tightening torques

Tightening torque [Nm] for screws with metric threads + head contact surfaces									With thread measured in inches	
Thread	+ wedge lock washers						Stainless steel screws A2 and A4		Screw plugs with elastomer seal	
	5.6	8.8	10.9	8.8 + Alu*	8.8	Rust-proof A4-70	Property class 70	Property class 80	Thread	Galvanized + stainless steel
M 3	0.6	1.5	–	1.2	1.5	1.1	–	–	G 1/8"	13
M 4	1.4	2.9	4.1	2.3	3	2	–	–	G 1/4"	30
M 5	2.7	6.0	8.0	4.8	6.0	3.9	3.5	4.7	G 3/8"	60
M 6	4.7	9.5	14	7.6	10.3	6.9	6	8	G 1/2"	80
M 8	11.3	23.1	34	18.4	25	17	16	22	G 3/4"	120
M 10	23	46	68	36.8	47	33	32	43	G 1"	200
M 12	39	80	117	64	84	56	56	75	G 1 1/4"	400
M 14	62	127	186	101	133	89	–	–	G 1 1/2"	450
M 16	96	194	285	155	204	136	135	180	* Reduced tightening torque when screwing into aluminum	
M 18	133	280	390	224	284	191	–	–		
M 20	187	392	558	313	399	267	280	370		
M 24	322	675	960	540	687	460	455	605		

Tab. 1 Tightening torques

Contents of the EC Declaration of Conformity

The screw pumps described in these operating instructions are machinery in the sense of the Directive 2006/42/EC. The original of the EC Declaration of Conformity is enclosed with the machinery at delivery.

The machinery fulfills all the relevant provisions of the following directives:

Number	Name	Remark
2006/42/EC	Machinery Directive	–
2014/68/EU	Pressure Equipment Directive	–
2014/30/EU	Directive on Electromagnetic Compatibility	Only for machinery with electrical components
2014/35/EU	Low Voltage Directive	Only for machinery with electrical components
2014/34/EU	Directive on Use in Potentially Explosive Areas (ATEX)	Only for machinery in ATEX version

Tab. 2 Directives observed



KRAL